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Native left ventricular myocardial T_1 spatial heterogeneity in non-ischemic dilated cardiomyopathy

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Background

Myocardial fibrosis is involved in the pathology of non-ischemic dilated cardiomyopathy (NICM). Recently, the application of native (non-contrast) myocardial T_1 measurement has been proposed as an imaging biomarker of cardiac remodeling. However, spatial heterogeneity in T_1 measurements has been observed across different segments and slices. Furthermore, T_1 values measured with current T_1 mapping sequences are influenced by myocardial T_2 values. The objective of this study was to 1) assess the spatial heterogeneity of T_1 measurements across different segments and slices in healthy subjects and patients, and 2) determine the association of native T_1 with myocardial structure and function.

Methods

We prospectively studied 39 NICM patients (LVEF≤50% without evidence of prior infarction by CMR) and 30 subjects with normal LV systolic function without known cardiovascular disease. CMR was performed using a 1.5-T MRI scanner (Philips Achieva). Native T_1 mapping was performed using slice-interleaved T_1 mapping sequence (STONE) [1]. T_2 mapping was performed using slice-interleaved T_2 mapping [2]. Voxel-wise T_1 and T_2 were estimated using a 2-parameter and 3-parameter model [3]. All images were corrected for motion [4]. T_1, T_2, and extra-cellular volume (ECV) measurements were measured using a 16 segments AHA model across the base, mid, and apical LV.

Results

NICM participants (57 ± 15 years) were predominantly male (74%). By design, all had a reduced LV ejection fraction (mean LVEF 34 ± 10%). Figure 1 shows native T1, T2, and ECV in two patients with a NICM. Parametric maps to the right in each panel demonstrate full ventricular coverage. The regional distribution of native myocardial T_1 was similar in patients with and without NICM[RN1], as shown in Figure 2. Relative to subjects without NICM, subjects with NICM had a higher native T_1 (1131 ± 51 vs. 1070 ± 28 msec; $p < 0.0001$), a higher ECV (0.28 ± 0.04 vs. 0.25 ± 0.02, $P = 0.001$) and a longer myocardial T_2 (52 ± 8 vs. 47 ± 5 msec; $P = 0.01$). After multivariable adjustment, a lower global native T_1 time was associated with a higher LVEF ($b = -0.59$, $P = 0.0003$), higher right ventricular ejection fraction ($b = -0.47$, $P = 0.006$), and lower left atrial volume index ($b = 0.51$, $P = 0.001$).

Conclusions

In NICM, native myocardial T_1 is elevated in a homogeneous manner, suggesting a global (not regional) abnormality in myocardial tissue composition. This low variability is similar between healthy and NICM patients across different segments. For subjects with NICM, native T_1 is associated with biventricular systolic function and left atrial volume, and may represent a non-contrast marker of tissue remodeling in this cohort.

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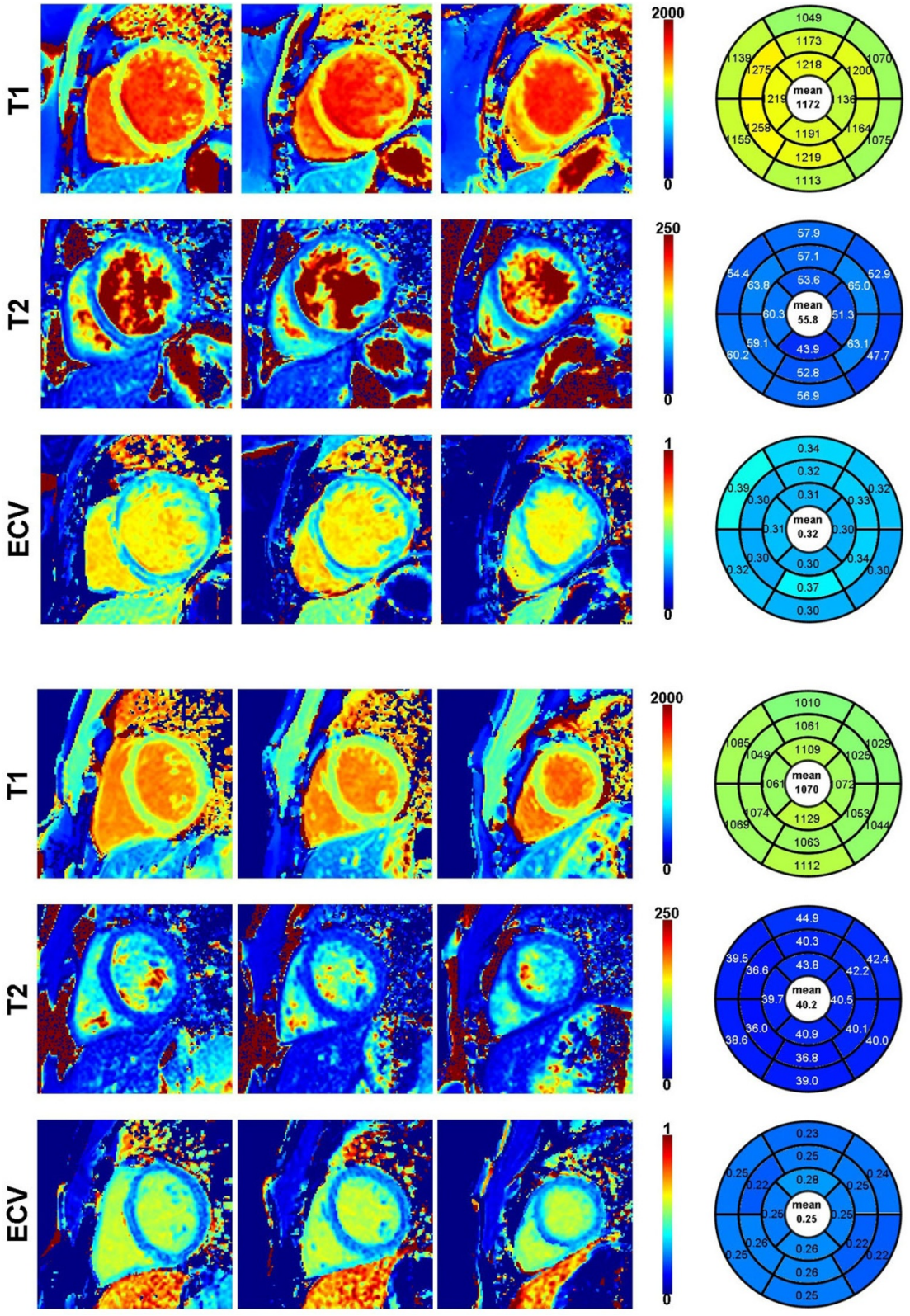

Figure 1 (A) Images from a 47-year-old woman with a NICM with moderate reduction in LV function (LV ejection fraction 30%). (B) Images from a 39-year-old heathy male (LV ejection fraction 61%).

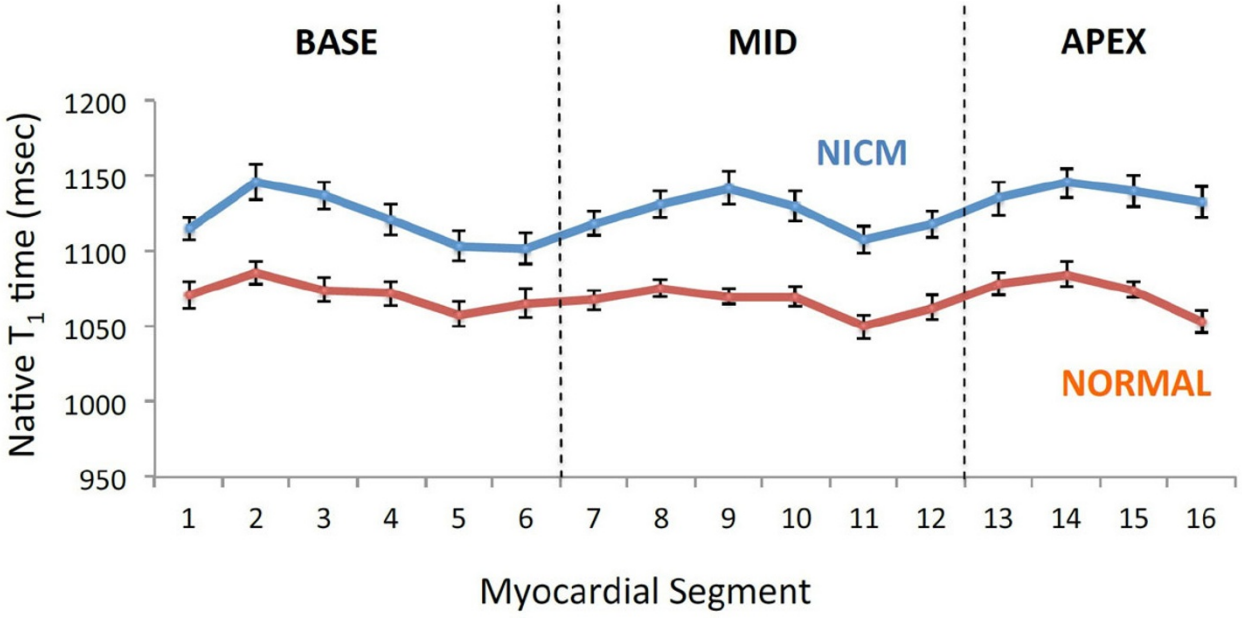

Figure 2 Variability in segmental native T_1 across all 16 myocardial segments in individuals with normal LV function (red) and study participants with NICM (blue). The error bars represent standard error of the mean.

References

1. Weingartner: *MRM* 2015.
2. Basha: *MRM* 2015.
3. Akcakaya: *MRM* 2015.
4. Roujol: *JCMR* 2015.

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